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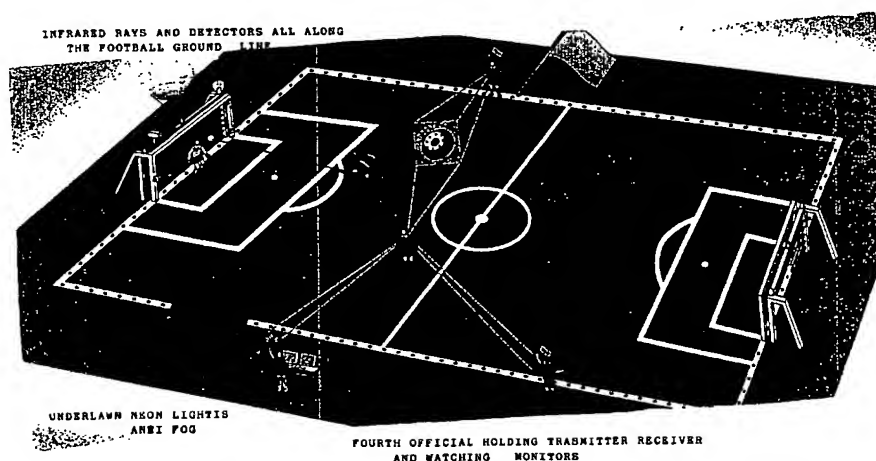
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(54) Title: **GOAL DETECTION EQUIPMENT FOR FOOTBALL**



(57) Abstract: For the realization of the industrial project above mentioned, look at all the phases for creating the electronic bladder. Ten different versions have been invented to lodge the microsensors, up to the enough quantity, or the pressure system itself. Pictures (1), (2), (3), (4), (5), (6), (7), (8), show how the electronic sensors of survey and transmission can be lodged. Pictures (9), (10), show the cobweb that can be created in the center of the bladder to lodge the pressure microsensors, the metallic surveying microsensors, or the infrared rays ones. Picture (11) shows the lodging of the electronic surveying system under the grass cover, that immediately transmits any signal noticed to the chronometer or bracelet in endowment to the central referee or to his collaborators. Always in the figure (11) the signs show as: (A) the electronic football is going to enter the goal line, (B) half of the electronic football over the goal line, (C) the electronic football has (B) gone beyond the goal line. The referee immediately receives communication of the happened goal.

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INDUSTRIAL PATENT DESCRIPTION**GOAL DETECTION EQUIPMENT FOR FOOTBALL**

The invention described herein concerns the field of sports equipment. Namely, it consists of both mobile and ground-based equipment with magneto-acoustic DR anti-tampering electronic systems (DOUBLE RESONATOR 58 K H Z) of any type. Both soccer and 5-a-side football are very popular sports, played on suitable pitches with a lawn or synthetic green. In both football and 5-a-side football the referee cannot assign scores if he has not seen the ball cross the goal-line.

In recent examples, the referees in football matches have not called a goal even when the football had gone over the goal line for about 80 cm. As per football regulations, a goal is scored when the football crosses the goal line, i. e. the 12-cm-thick line going from the right post to the left one, forming a rectangular area called the goal area (length= mt 7.32; height: mt 2.44).

The industrial invention entitled "Electronic Sports Equipment - A New Fully-Fitted Football Ground" was devised to give certain, immediate and unobjectionable notice of the goal to the referee, who might have missed to see it, either for an oversight or because his view was covered by the players standing before him, or else for other unintentional mistakes. Whatever the reason, the fact that a goal has not been called is detrimental to either team; the present invention would eliminate all grounds for doubts on the referee's bad faith or uncertainties. As shown in the drawings, the "axonometric plan" (sheet no. 1) describes all the possible electronic options to be adapted to this invention. Drawing no. 2 shows the full equipment located behind the goal as well as its possible position. The components may be placed in different horizontal and vertical

positions at different distances. The electronic components may be located in either radio detection raceways or special transparent devices of suitable materials, avoiding all the fibers that may be dangerous for the goalkeeper and nearby attendants. The Electronic Football Detection Area starts at 30 cm inside the goal line, that is, outside the football ground. This favours electronic detection because the goalkeeper or other players sometimes lean against the post or run inside the goal area while playing. As shown in pictures 3, dwg no. 2, the drawing of the detection area includes three circles which represent the football entering the goal. Pictures A represents the football entering the goal. In this case the referee should call a scored goal; should he fail to do so, the scored goal would be immediately detected by the electronic system and the referee and his co-operators would be informed by means of a VIBRACALL signal or a LED fitted in their wrist or pocket watches, whichever they prefer.

Pictures B shows that the football has not crossed the white goal line; thus, it is not possible to call a goal. However, referees may sometimes make mistakes because their view is hindered when the ball is stopped by the goalkeeper or a back player defending the ball from the opponents.

Pictures C shows a football that has not even started to cross the goal line; this means that a goal can not be called. However, goals are sometimes called, either because of an action by the forward players or because the referee and his co-operators cannot see the action properly. This leads to enraged objections on behalf of the football teams and their supporters. The mistakes made by referees are discussed for weeks after the match and their actions are questioned, not to mention the damage done to the football ground facilities by the team supporters.

Drawing no. 3 shows the "Electronic Goal Detection System". This system is useful to prevent an unfortunately common mistake that has occurred several times in the past few years. Pictures 4 shows the electronic detection systems to be fitted horizontally,

whereby the component which is to detect the football when crossing the line (see Pictures 3, item A) is located underground behind the goal line, with no damage to the device or the goal area, as shown in the front view (Drawing no. 4, enclosed herewith) in its different options to be adopted for the correct detection of the football crossing the line, as shown in A.

All the proposed solutions are acceptable. The electronic devices may be located either Separately or assembled together in order to achieve the required aim, i.e., inform the referee when a goal is scored, in real time and with no mistake, by means of the relevant watch which adopts the same system (as shown in the enclosed pictures) in different versions: round, rectangular, square and pocket watches.

The detection sensors may be either passive (as in this case) or active (in future implementations). The sensors included in the description attached to the application are verifiable and suitable to this purpose.

Technical report:

Electronic cabin of the fourth official

The electronic cabin is defined as an exclusive location pertaining to the fourth official, Who may replace the referee at any time during an official match, e.g., in case the Referee is injured, even temporarily, or for any other reason. This is an enclosed space whose transparency ensures a perfect view, comfort and safety.

The technical characteristics described herein are devised to offer the best possible conditions to the person operating in the cabin. Its size is limited to avoid any hindrance to the view of the football ground. It is a pleasant-looking structure with reduced encumbrance. The steel and aluminium frame is lightweight and made of components which are easy to carry and assemble. Its adjustable cover protects the cabin from any weather which may hamper the fourth official's correct view. Its surface is a suitable

space for possible sponsors.

The clear panels, which are inspired by squash courts, are made of LEXSAN or other Plastic material which offers suitable strength and transparency.

The roofing may be closed on the sides only, or also frontally, if necessary. Access is through side doors without any metal parts.

The back wall is screened, which may offer a suitable space for sponsors.

The base gives stability to the structure and separates the internal electronic equipment From the football ground, besides providing room for the required power cables.

The interior of the cabin is furnished with a desk for two operators and computers, two seats and a small filing cabinet where documents and any other necessary objects may be stored. However, the cabin may be built of bigger size to house several operators, should it be required to ensure maximum operational certainty and reliability.

The top band consists of LEDS of different colours, displaying the decisions of the fourth official or ordinary information concerning player changeovers during the game.

Finally, electronic detectors (or cameras) are located which, together with the electronic system, give support information to the fourth official who may check the referee's decisions and correct his mistakes. For example, when fouls occur within the penalty area, whereby a player is sent off the field or a penalty is kicked, these fouls are sometimes overlooked and a penalty is not called, whereas by placing three fixed cameras behind the goals and one behind the corner flag post, football teams would no longer be damaged and malicious fouls would be punished. Thanks to the intervention of the fourth official, this device would help solve many instances that are unpunished today because the referee and his co-operators do not act promptly. All the technical specifications of the project are shown in the enclosed drawings and pictures A, B, C, D, E. Width is 2 mt, length is 2.5 mt and the roof may be open to 2.41,84. The cabin may vary in size up to a 12-mt length. It may also be adopted as benches for both teams, so

that there are consistent designs and dimensions all over the football ground. The fourth camera is to be located at an 8-mt distance from the corner flag post and behind the linesman, thus allowing the fourth official to call an offside more correctly. Off sides often cause objections against the referee's official decisions during and after Football matches.

Referees may make mistakes due to an oversight or because they move across the field to reach a better position and cannot decide immediately, whereas the fourth official may immediately signal his autonomous decision to the referee. So the device would enable the referee to be immediately informed by means of the receiver located in the stopwatch or through the VIBRACALL or displayed on the cabin. This device would then give great advantages in terms of ethical behaviour and peacefulness, with no occasions that may lead to damage to property, injuries and casualties. The decisions made by the referees would then be displayed in real time on the advertising screens that may now be found in many football grounds.

The camera behind the corner flag post may be located inside the post so that, in case of an oversight by the referee and the linesmen, the fourth official might decide on any case. For example, if the football has gone over the line but has curved going back into the field, then the linesman may be mistaken and objections may arise, especially if a goal is scored as a consequence of the same action. In such cases, a wide-range camera might solve this problem.

If there is fog, a football match could be suspended because the linesmen inform the Referee that they cannot see properly when the football goes over the goal line or the side line, the equipment may help overcome this difficulty (see enclosed drawing) by configuring the football ground with red light dots. Another possible solution is to place an underground parallel line beside the side lines, at a distance equal to the

circumference of the football. It would be made of synthetic material and include a red (or other suitable colour) neon light, which would become visible to the linesmen both in the event of fog or occasional snowfall which would cover the lines. The line is 12 cm wide and as long as required, and houses a battery neon light which is safe in any weather conditions and for all participants, whether supporters, attendants, operators and players. The only necessary operation is powering the battery to create an underground, connected parallel line, which would allow completing the match even in case of a snowfall, as the heat generated by the neon light would melt the snow falling on the line during the match. The distance of the buried neon light would enable the linesmen to decide whether the football has gone over the line.

Electronic football Description

This football consists of hexagons and pentagons and is much alike an ordinary football, used by football teams all over the world. The only difference is that it includes several sensors signalling when the football has gone over the 12-cm goal line described above, marked at the end of the football ground, which would mean that a goal has been scored as soon as the football has crossed all the white line.

The sensors may be electronic sensors, pressure or metallic detection ones, or infrared detection sensors as well. One or more sensors may be applied and adapted in suitable position in the bladder or in the inside volume of the ball.

Their position has to be chosen to guarantee:

The correct detection of the ball crossing the goal line and/or the moment when the Player kicks it;

- the correct director indirect transmission to the referee of the signal that the above mentioned situations have occurred.

The Sensor may be fixed to the bladder or in each position in the internal volume of the Ball in one of the following ways or in a combination of some of them:

- 1 sticking or direct fixing any part of the Sensor on any internal surface of the ball (example in picture 1);
- 2 sticking or fixing of any container or support of the Sensor of any shape and size (example in picture 4);
- 3 insertion of the Sensor in a pocket or marsupium integrated in the bladder, or fixing /sticking of the pocket or marsupium which contains the sensor to the bladder (example in picture 5);
- 4 all the systems above listed may be realized adapting or not the sensor surface to the support one or vice versa (example in picture 3);
- 5 fixing of the Sensor on the internal surface of the ball through one or more supports whose ends/extremities are stuck or fixed in any way to the support surface (example in picture 6); the fixing of the sensor to the support may be obtained in any of the different methods listed in point 1, 2, 3, 4, 5, 6;
- 6 fixing of the Sensor in any way to the internal volume of the ball through partial or total filling of it, with material of any density and chemical nature, single or composite, expanded, flexible or compact, not fixed to the surface of support or fixed to it in any way (example in picture 7);
- 7 fixing of the Sensor through one or more straps of any shape and size, drawn in the bladder through openings made in it, or created during the phase of press, or applied after the press by sticking or fixing them in any way to any part of the internal surface of the ball (example in picture 8).

The football becomes neither heavier nor bigger, as the sensors weigh under 10 gr. The sensors are of different sizes and frequencies, and are all used for the purpose envisaged by the industrial patent herein, i.e., to transmit all the solutions to the receivers, VIBRACALL watches, advertising displays and any possible further applications, that

May be found in the future through worldwide research studies.

They may be located either vertically or horizontally, provided they are not bent when fitted in, otherwise their function to signal when the football has crossed the goal line may be hampered.

The distances of the ULTRA Post Dual Transceiver may vary. They may be set behind the goal, i.e., at the back of the goalkeepers who are not disturbed by their presence, as they may be set in different positions and spaced both horizontally and vertically according to what are thought to be the best detection positions, to be decided during set-up.

The best location for the Ultra Post Dual Transceiver according to the current Conditions is under the lawn and behind the goal, as shown in the attached drawing, where they are located horizontally. For detection purposes, they are to be located at a 122-cm distance from the lawn level and above, to detect the passive sensor located inside the football bladder. Its special detection positions, on the directions of the hexagons and the pentagons of the football, signal in real time that a goal has been scored, informing the referee and his co-operators through their stop-watches.

The sensors are located at various distances along the full height (2.44 mt) and length (7.32) of the goal, thus forming an invisible detection grid behind the goalkeeper.

Starting from a 34.300-cm distance, adding the diameter of the football and the goal line, The Ultra Post Dual Transceivers may be located at approx. 60-cm intervals, until Reaching a distance that is thought to be sufficient, up to 3 mt from the goal line and behind the goalkeepers.

In order to fully cover the goal, you may locate 4 autonomously operating Ultra Post Dual Transceivers in a line. They may operate separately or jointly.

According to the industrial patent design described herein, any equipment currently manufactured worldwide may be used for detection purposes. Any adaptable systems

may be used to detect a football crossing the goal line and allow the referee to call a goal in real time and with no mistakes.

The sensor signals a goal each time a football crosses the goal line, so that the referee may no longer avoid calling a goal for whatever reason, including when a back player or the goalkeeper kick the ball back.

CLAIMS

1ST CLAIM: the industrial invention concerns mobile electronic equipment with support structures, including equipment to be located behind goals and anchored to the football ground in soccer or 5-a-side football matches.

The support structure of the equipment consists of assembled support bars, metal plates and components in other strong fibres. The components are basically tubular, but other dimensions and shapes are allowed, such as oval-shaped components.

Stiff basements connect bars and other components support the electronic devices located opposite and parallel to the components buried under the lawn, behind the goals and at the back of the goalkeepers.

The anchoring components include stiff basements to be fixed to the ground. Other anchors of any size and material – whether metal or synthetic – may be buried under the lawn to firmly support the whole frame.

2ND CLAIM: mobile electronic equipment according to claim no. 1, whereby the electronic system includes a set of assembled electronic components, ensuring the solution to the problem which is the aim of this industrial invention, i.e., how to enable a referee to call a goal in real time, with no possibility of an oversight. The equipment assures that the football has crossed the goal line and all mistakes on behalf of the referee are avoided by means of a lawful method.

The mobile electronic equipment for soccer and 5-a-side football, described in claims no. 1 and 2, includes all the connected systems for the purpose of the invention: a stopwatch, whether rectangular, round or square, which houses the electronic systems – whether metal detectors, infrared or Vibracall – whereby the referee and the linesmen are informed in real time in order to assess the correctness of the signalled information and call a goal immediately, with no possible objection by the teams or their supporters.

3 RD CLAIM: mobile electronic equipment, described in claims no. 1 and 2, using any components available worldwide in order to ensure technologically advanced and fast solutions. Worldwide manufacturing companies in the field of electronic devices may supply suitable electronic systems and components to promptly inform the referee when the football has entirely crossed the goal line. The movement of the football is thus detected and transmitted in real time to both the referee and his co-operators, thanks to suitable electronic stop - watches, equipped with a Vibracall and displaying the time when the goal is scored as well as current date and time (whether in a 12- or a 24-hour format), similar to an ordinary stop - watch, but updated to include a radar-based detection system.

4 TH CLAIM: The mobile electronic sports equipment described in claims no. 1, 2 and 3 includes a claim for a different version, whereby the equipment is buried behind the goal, at the back of the goalkeeper. The equipment is perfectly effective and starts operating when the football match starts. Broken or intentionally damaged electronic components may be easily replaced; the bearing structure protects the components which may be removed and replaced at any time, before the match starts, after the interval or at the end of the match. In the event of system failure the maintenance technician is informed by means of suitable transmitting sensors, which allow assessing the conditions of the equipment in real time, through the stop - watch that the referee and the linesmen are provided with. The claim also includes a claim for the electronic bench, as technically described above, which houses the fourth official.

5 TH CLAIM: The electronic sports equipment - a new fully-fitted football ground - described in the above claims no. 1, 2, 3 and 4, also includes all the electronic systems contained in the electronic cabin, described in the attached drawings, i.e., cameras and sensors that send signals to the referee and linesmen in real time, at any time

throughout the match, whenever a foul is committed by a player who is not punished accordingly. In this case the referee is informed through the sensors located in the electronic stop-watch and, by pressing a button on the watch, he may decide whether to send the faulty player off the field.

Another instance is when, during the match, the referee cannot see a penalty. In this Case his co-operator informs him promptly by means of the electronic system. If the fourth official has noticed an offside that the referee and the linesmen are not aware of, he may call the referee by means of a transceiver, whereby a penalty is called for an offside, thus preventing all the enraged objections that arise when a goal is scored as a consequence of that unpunished foul.

In any case, the equipment is a perfect solution whenever the referee and his staff need To discuss and make a joint decision.

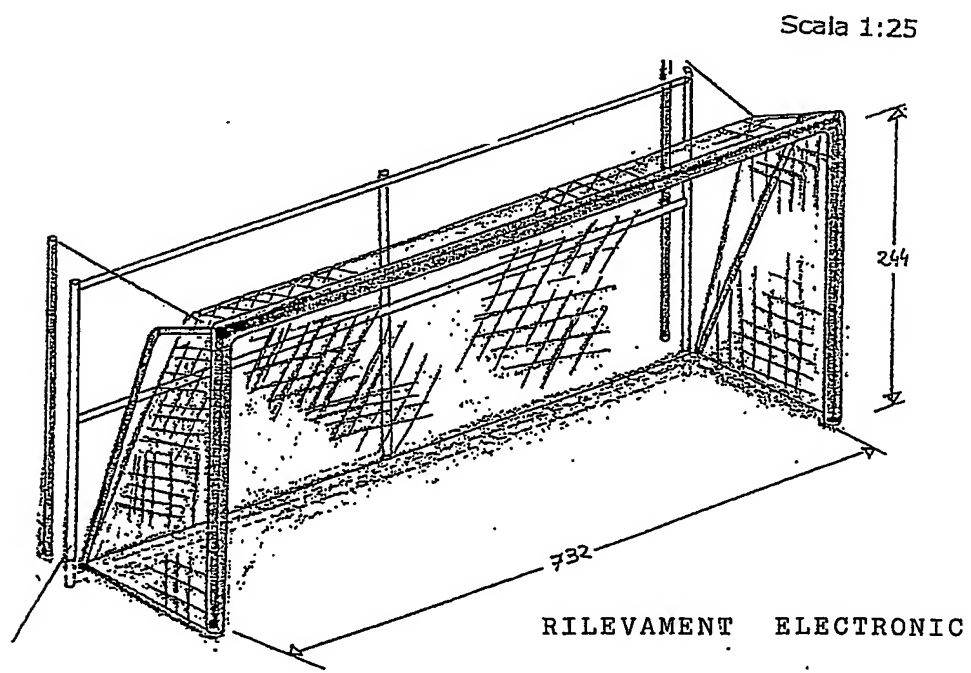
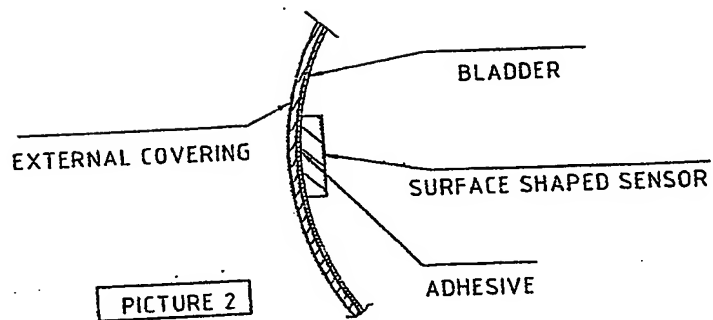
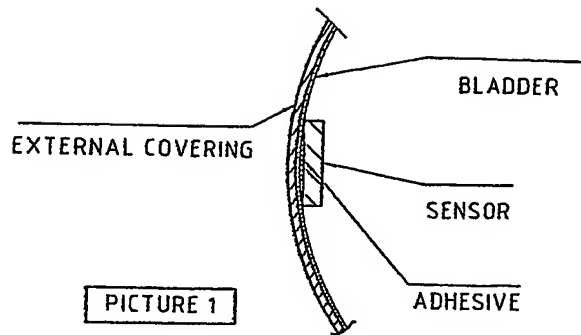
The electronic cabin may be located near the centre line, between the benches of the playing teams. Electronic displays of different sizes may be located beside the cabin and equipped with LED displays to promptly inform the public of the referee's decisions. LED light up when the sensor in the stop-watch gives an input or when it is triggered by means of the electronic system itself. All the spectators may immediately read the decisions made by the referee and the fourth official is sheltered from any weather conditions as well as any excessive reactions by the public.

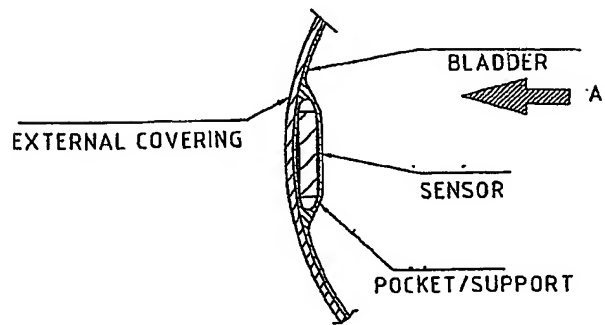
This invention would allow making any decisions in a lapse of time that is not over a Second , which is useful to referees and their co-operators when making joint decisions. This would moreover avoid any delay that may lead to excesses, invasions of the playing area, protests and players sent off the field.

Prototypes of suitable sensors are attached hereto. These sensors are to be fitted in the bladder of the football or inside the hexagons and pentagons with suitable rubber pads (whether hard or soft) to avoid any bumps on the football surface which would hinder

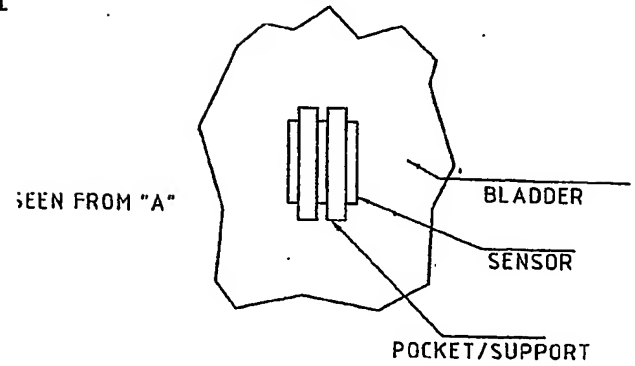
the actions in the game. Hexagons and pentagons would not be damaged and the football 1 may be detected as soon as it has fully crossed the goal line.

6TH CLAIM: The electronic sports equipment – a new fully-fitted football ground – described in the above claims no. 1, 2, 3, 4 and 5, also includes all the necessary systems for the implementation of the electronic flag, whereby the referee may co-operate more effectively with the fourth official and the linesmen during a soccer or 5-a-side football match. Suitable chips located in the flag signal an impulse given by the fourth official or a linesman who may inform the referee of any foul, such as an offside. In this instance, the fourth official triggers an impulse when the football is sent to a forward player. The signal is recorded by the flag and the linesman presses a button in turn when following the action, so that the control station may check whether the sequence of impulses may determine an offside, if the impulse was sent by the linesman prior to the fourth official's signal. In this case, the stop-watch of the referee starts vibrating and the action is stopped for an offside. On the contrary, if the fourth official's signal was sent before the linesman's the action is regular and the control station cancels both signals. Likewise, all actions during the game may be signalled to the referee by this method or Similar methods, including Vibracall signals on the flag.

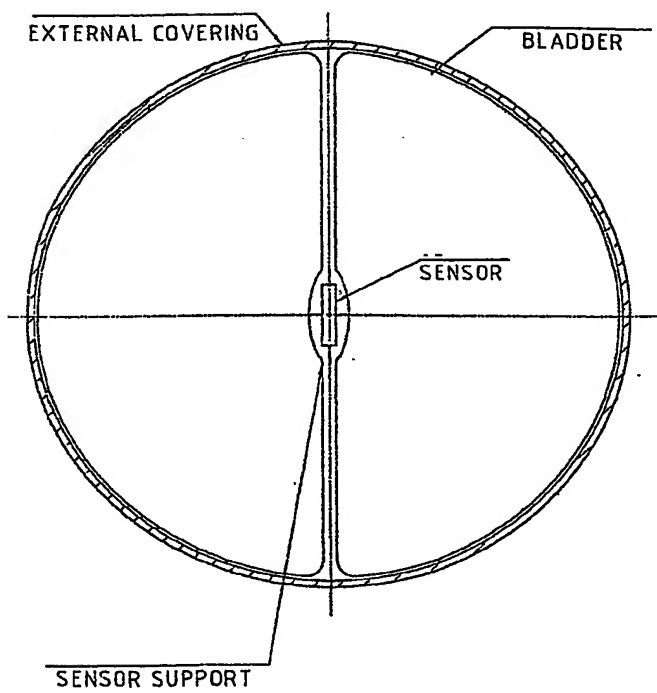




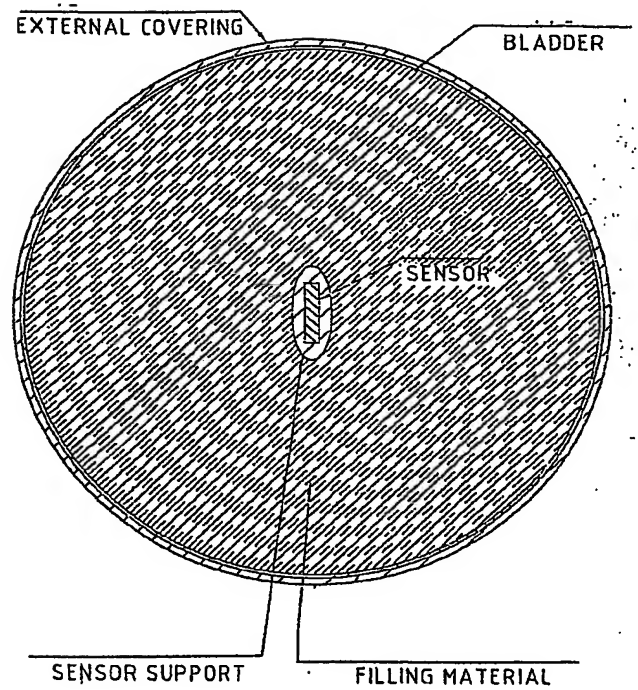
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PICTURE 8

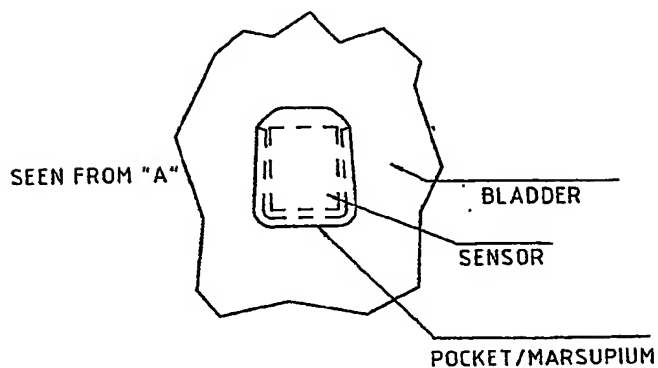
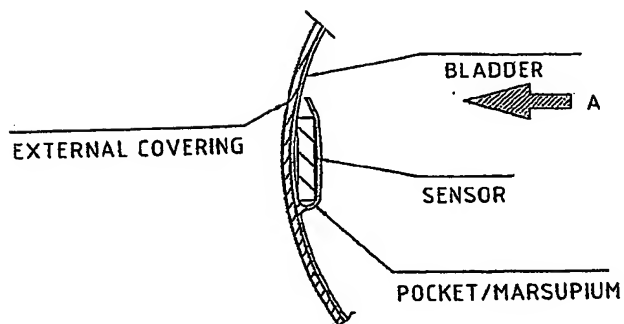
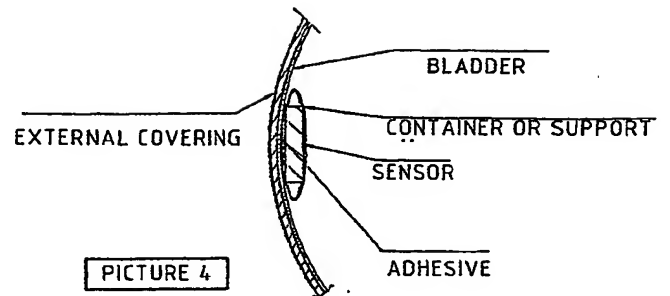
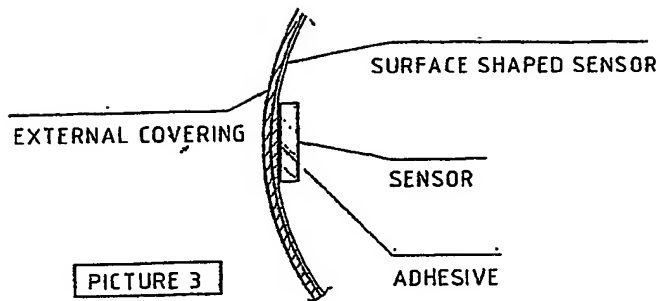


PICTURE 6



PICTURE 7

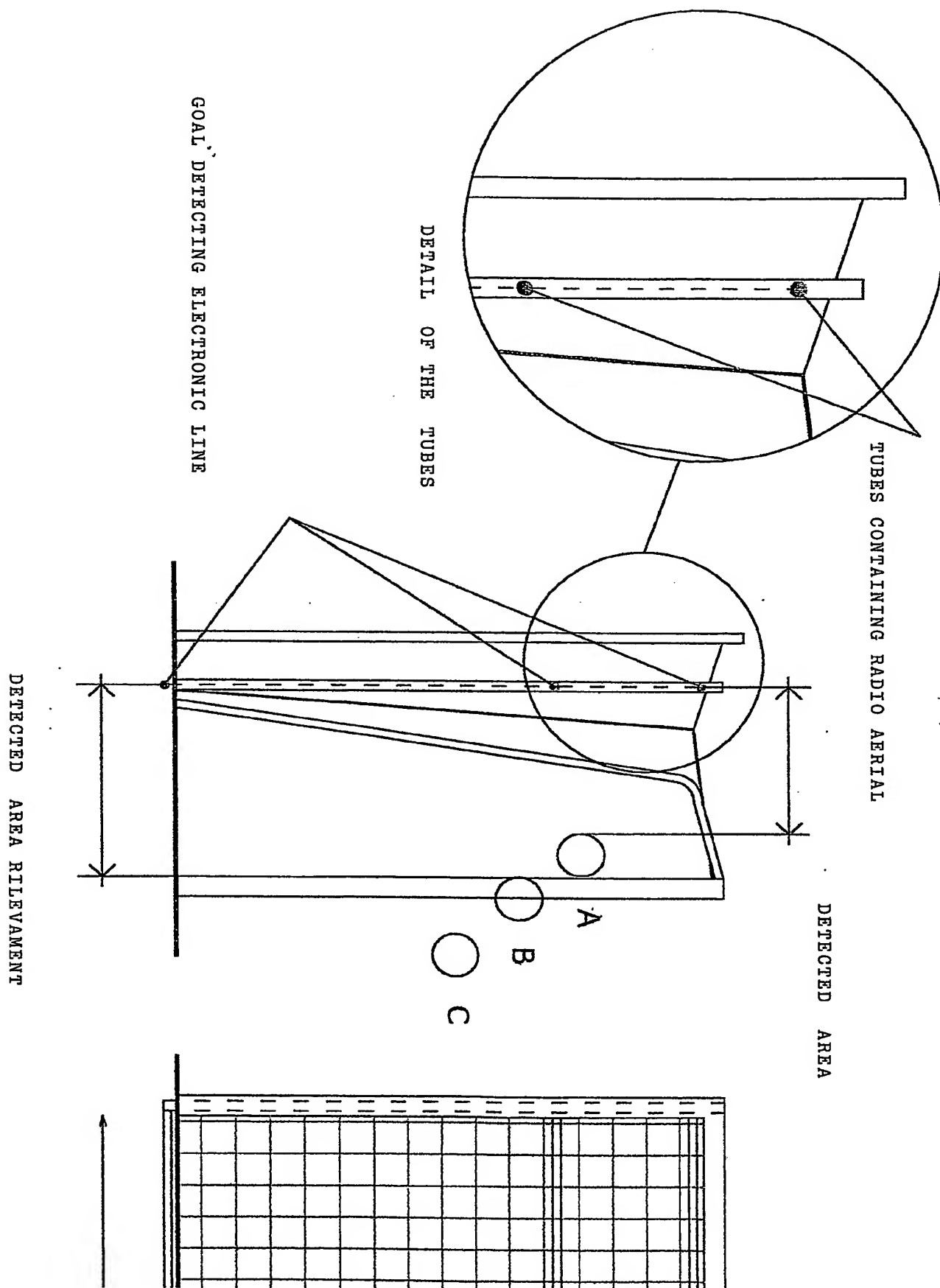
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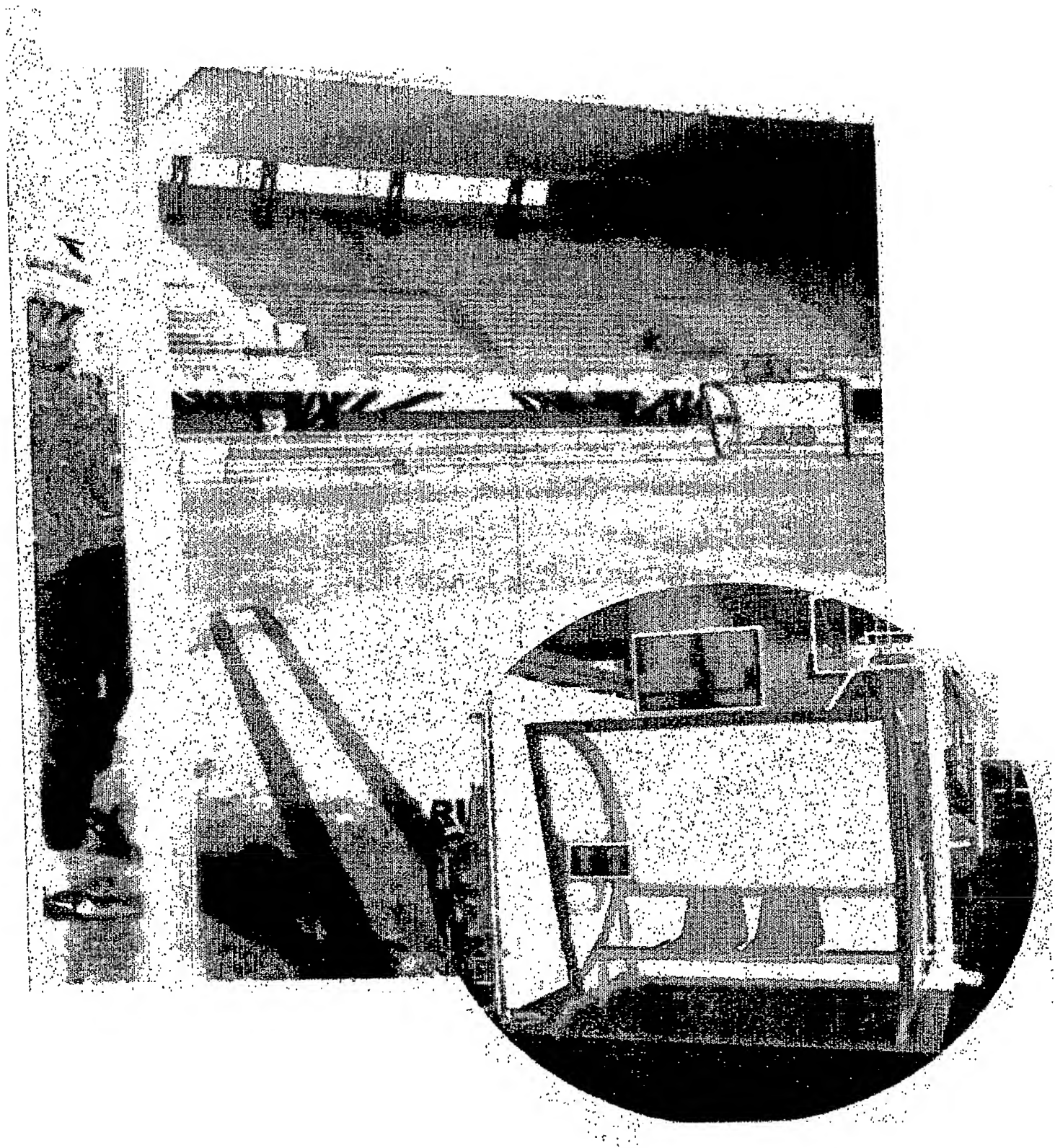


PICTURE 5

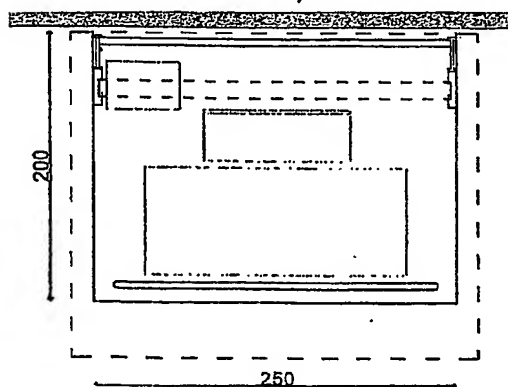
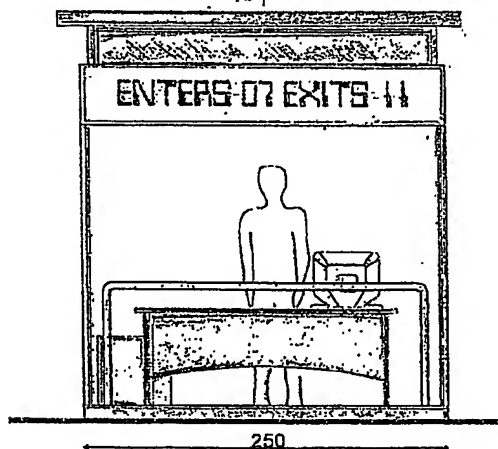
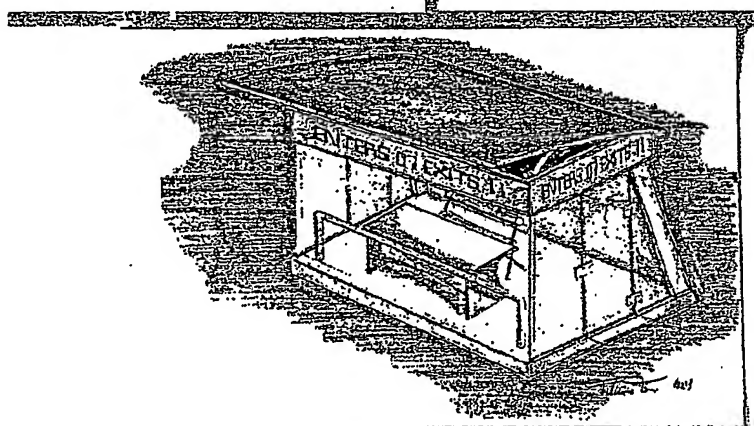
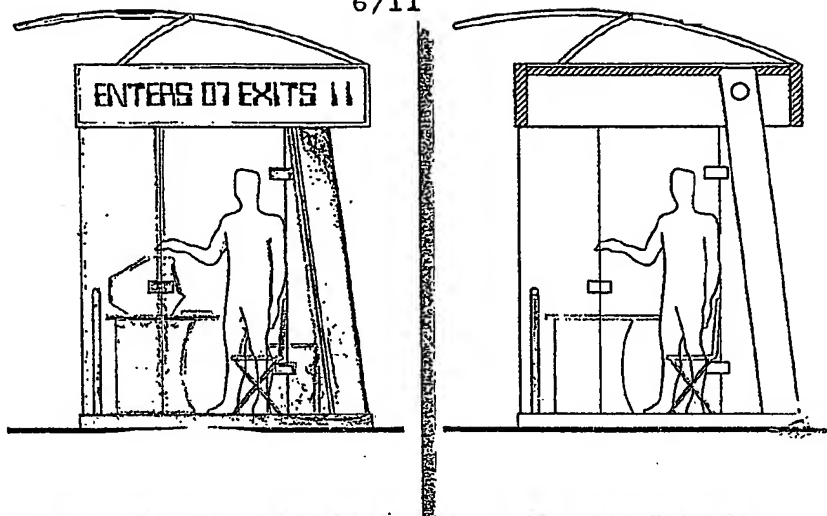
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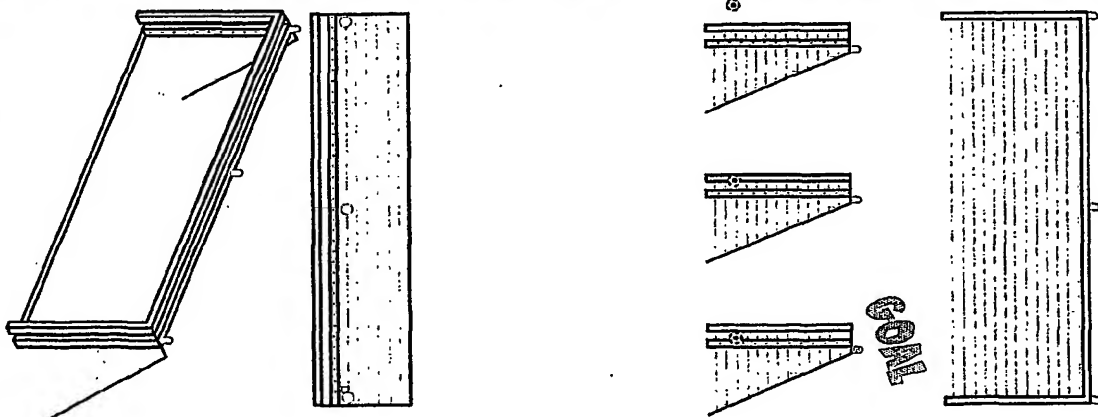
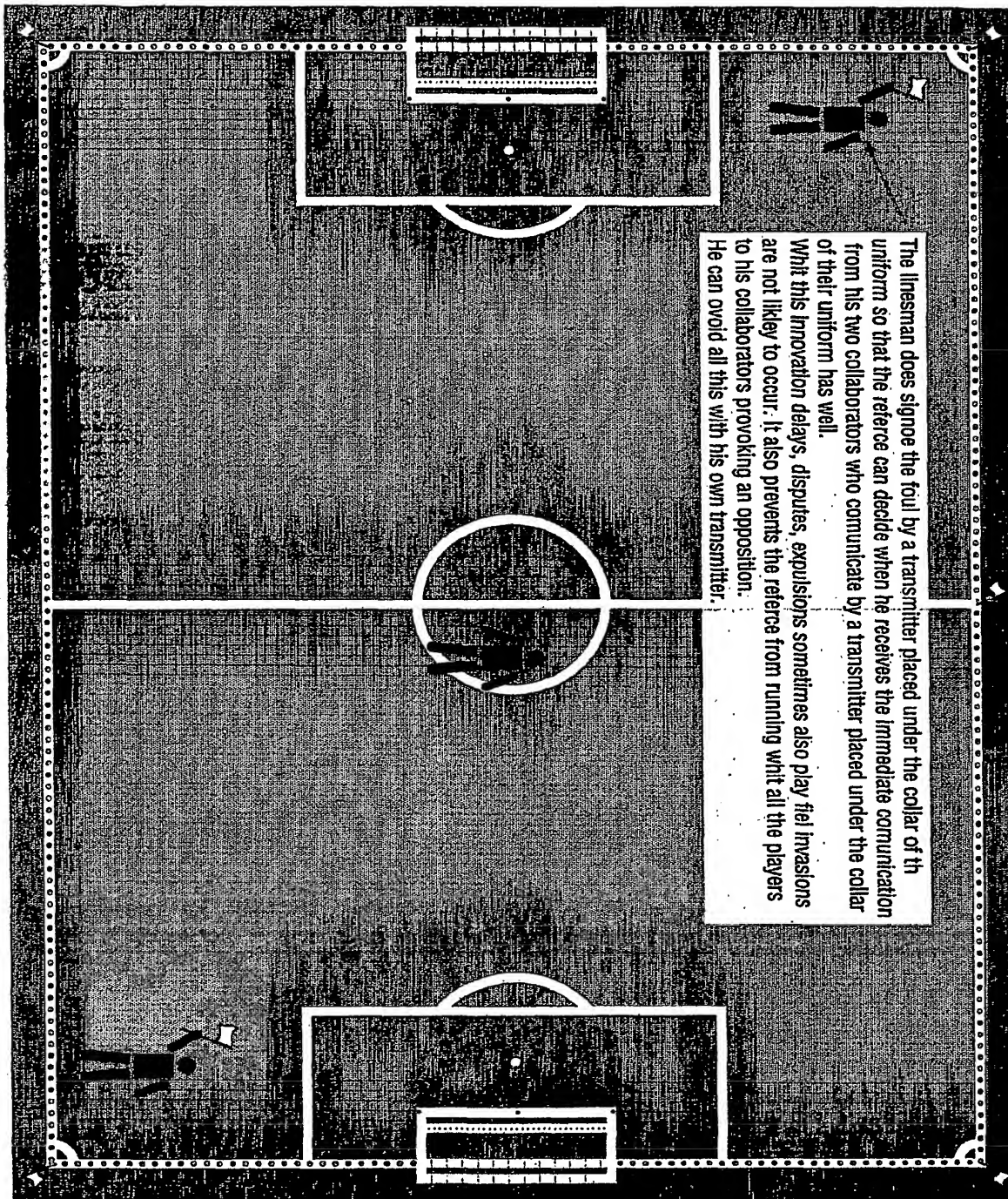
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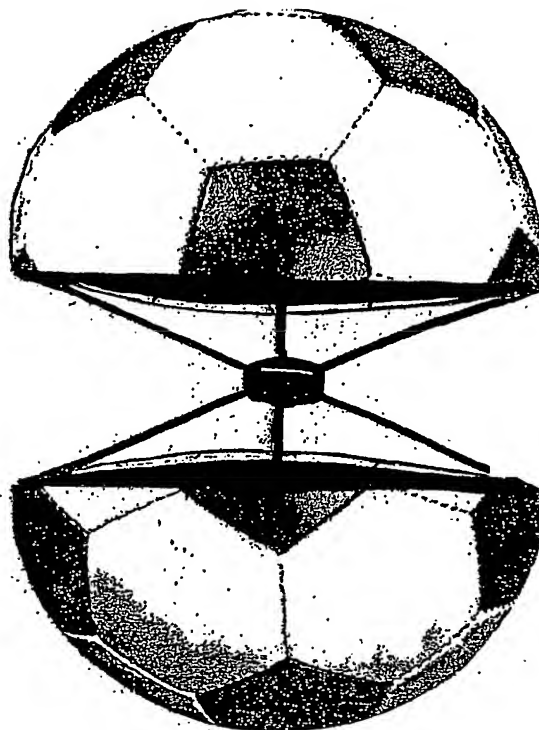
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DRAVING N. 7
PICTURE D

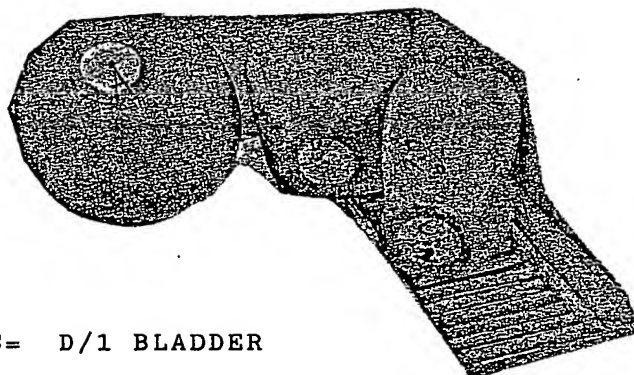
A = SENSORS IN THE CENTRE
OF THE BLADDER



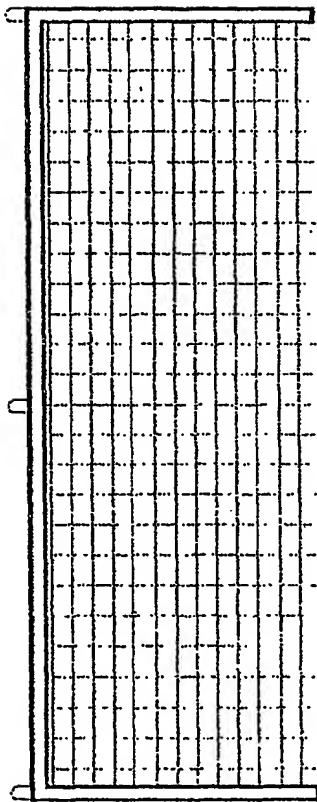
PICTURE B
STOP WATCH



PICTURE C = D/1 BLADDER

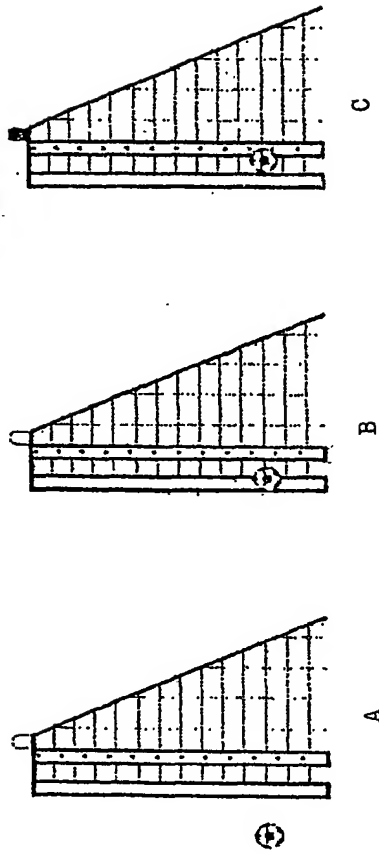


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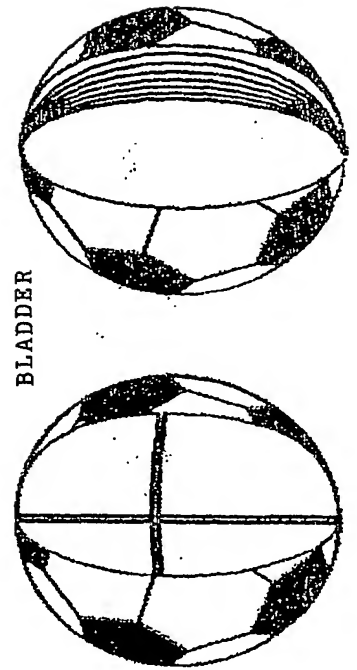


PICTURE 1

GOAL



PICTURE 2

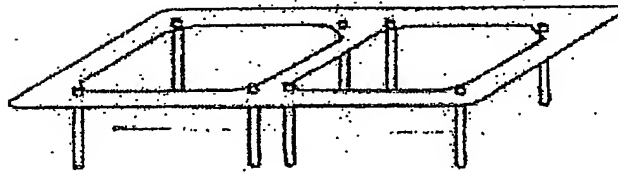


BLADDER

PICTURE 3

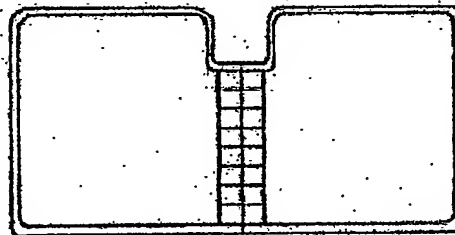
PRODUCT DIAGRAMS

Drawing n. 1

**Aerial Floor-Max Plus**

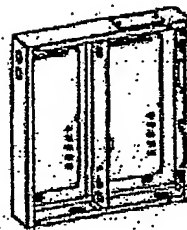
Width: 155cm
Length: 67 cm
Thickness: 2 cm
Weight (cable excepted)

Drawing n. 2



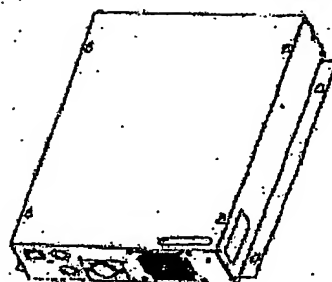
Screen for the aerial
Width: 180 cm
Length: 91 cm
Thickness: 1 cm
Weight (container): 6 kg
Weight (plate): 89 kg

Drawing n. 3

**Condenser card container**

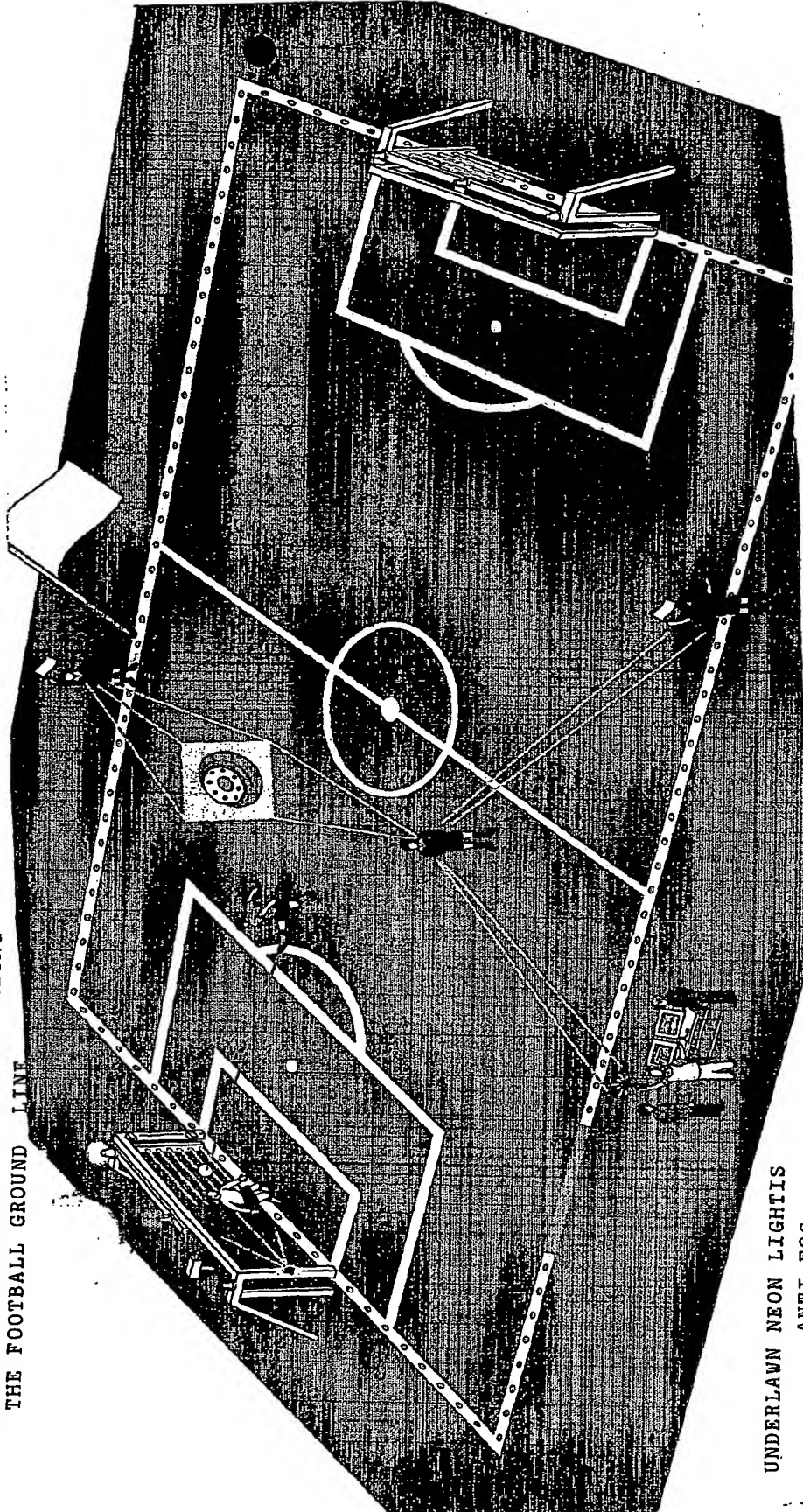
Height: 47.5 cm (18.7")
Width: 37.8 cm (14.9")
Thickness: 8.5 cm (3.3")
Weight: 2.4 kg (5.25 lbs.)

Drawing n. 4

**Centrale Ultra*Post Plus**

Height: 55.8 cm
Width: 37.6 cm
Width: (flangia included)
Thickness: 11.0 cm
Weight: 11.1 kg

INFRARED RAYS AND DETECTORS ALL ALONG
THE FOOTBALL GROUND LINE



UNDERLAWN NEON LIGHTS
ANEI FOG

FOURTH OFFICIAL HOLDING TRANSMITTER RECEIVER
AND WATCHING MONITORS

INTERNATIONAL SEARCH REPORT

International Search No.
PCT/IT 03/00019

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 753 633 A (VIENNOT EMMANUEL FRANCOIS ANDR) 27 March 1998 (1998-03-27) the whole document ----	1-6
X	GB 2 001 250 A (PRECITEC GMBH) 31 January 1979 (1979-01-31) the whole document ----	1-6
X	DE 20 51 386 A (RUDAT OTTO; HANKE HERBERT) 27 April 1972 (1972-04-27) the whole document -----	1-6

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: all in part

In view of the wording of the claims and description, presently on file, which render it difficult, if not impossible, to determine the matter for which protection is sought, the present application fails to comply with the clarity and conciseness requirements of Article 6 PCT (see also Rule 6.1(a) PCT) to such an extent that a meaningful search is impossible.

Consequently, the search has been carried out for those parts of the application which do appear to be clear and concise, namely:

a combination of
a football goal having incorporated therein, or surrounded by, detection means (page 8, paragraph 4)
a ball with in-built passive sensor means (page 6 paragraph 2 - page 7 paragraph 7)
signalling means to indicate when a ball has crossed the goal line, (eg page 2 lines 9-12)

The applicant should however be aware that due to the problems giving rise to the above objection, further prosecution of the application is unlikely to be successful.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/IT 03/00019

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: all in part
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IT 03/00019

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2342050	A	05-04-2000	NONE	
DE 29521945	U	22-07-1999	DE 19508742 A1 DE 29521945 U1	12-09-1996 22-07-1999
EP 1057502	A	06-12-2000	DE 29909729 U1 EP 1057502 A2	18-11-1999 06-12-2000
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FR 2753633	A	27-03-1998	FR 2753633 A1	27-03-1998
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DE 2051386	A	27-04-1972	DE 2051386 A1	27-04-1972